NuFlo

Clif Mock

True-Cut C21/C22 Isokinetic Sampler

User Manual

NuFlo Measurement Systems
A NuFlo Technologies Company

Manual No. 9104500142, Rev. B

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Description

True-Cut C Series Sample Probes (Figure 1) are designed in accordance with API Chapter 8, Section 2 and ISO 3171 to collect uniform samples of liquids flowing through a pipeline. The sample size is typically 1.5 cc, but may vary slightly according to temperature, pressure, viscosity, and other properties of the product.

True-Cut C Series Sample Probes are available in two models: C21 and C22:

- The C21 has a single-port valve seat, allowing one 1.5 cc sample to be taken during every 360° degree rotation of the sample probe.
- The C22 has a dual-port valve seat, allowing one 1.5 cc sample to be taken during every 180° rotation of the sample probe, or two samples (totaling 3ccs) to be taken during every 360° degree rotation of the probe.

The C Series sample probes utilize the isokinetic principle of sampling, ensuring that each sample is captured in its natural state. Isokinetic conditions exist when the linear velocity of the fluid flowing through the opening of the sample probe equals the linear velocity of fluid in front of the probe.

Figure 1—C Series sample probe

Installation

Probes should be installed in accordance with ISO 317 (Figure 2) and API Chapter 8, Section 2 (Figure 3) to help ensure that the samples taken are representative of the product flowing through the pipe. See Figure 4 for standard placement of these probes.

Note—If the pipeline is horizontal, place the probe 90° from the vertical centerline to help prevent plugging of the probe when the probe is not in service.

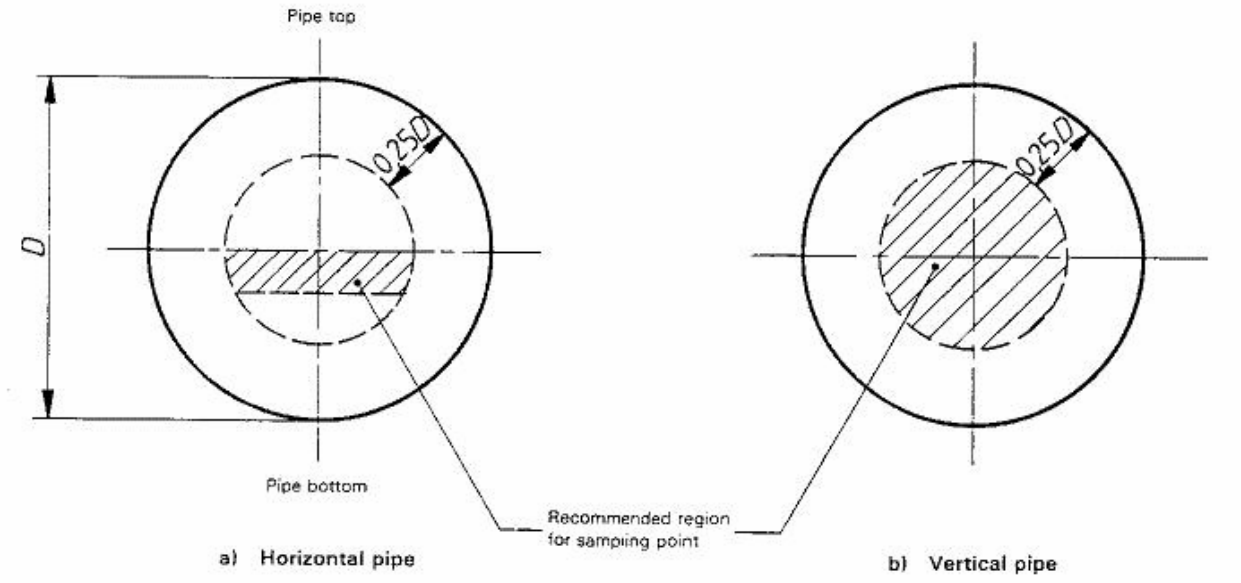


Figure 2 – Recommended sampling point regions for horizontal and vertical sample probe installations (as shown in ISO 317)

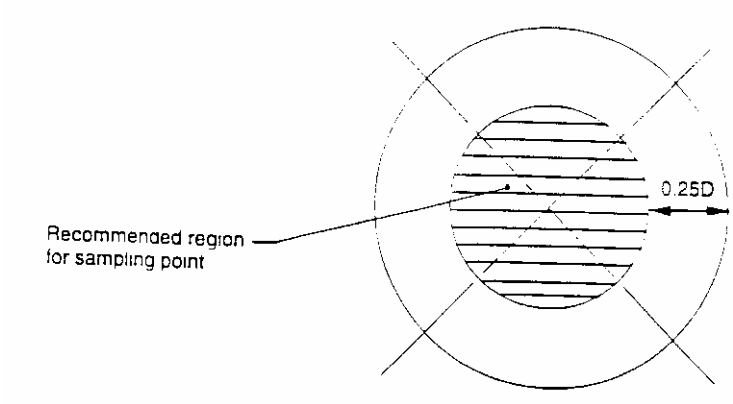


Figure 3 – Recommended sampling point regions for sample probe installations (as shown in API Chapter 8, Section 2)

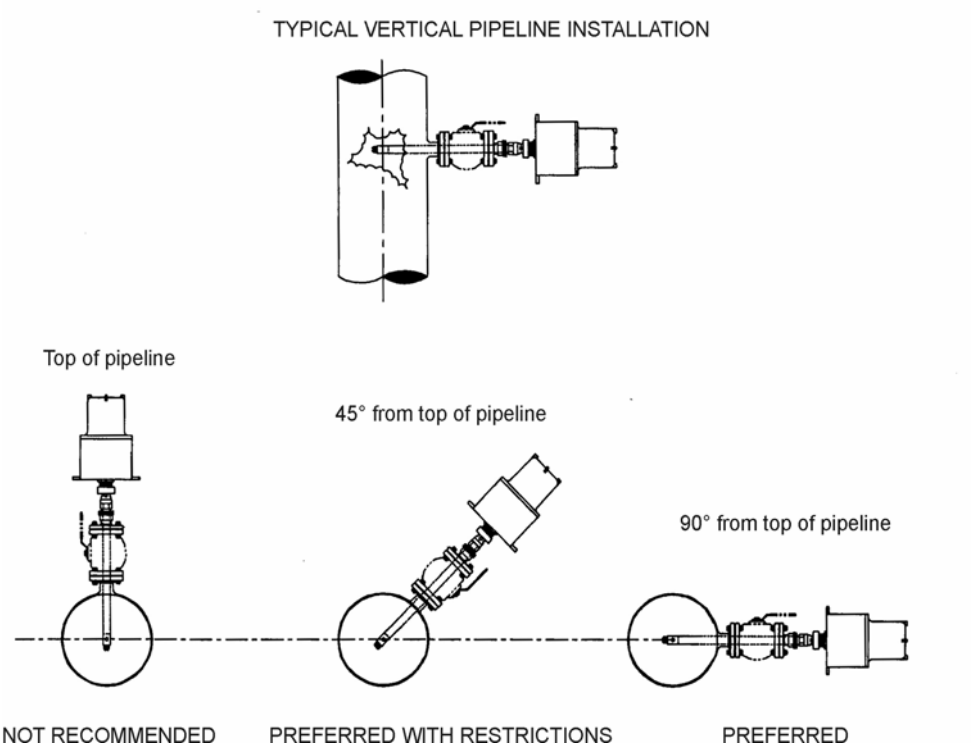


Figure 4—Sample probe orientation for horizontal and vertical installations

The sample probe can be installed by one of the following methods:

- 1 ¼-in.NPT 3000# threaded coupling welded onto the pipeline (Figure 5)
- 1 ¼-in. 3000# threaded installation coupling, nipple, threaded full opening ball valve,
  U-22 adapter into the pipeline (Figure 6)
- 1 ¼-in. × ANSI Class flange welded installation coupling, ANSI Class flanged full opening ball valve, U-22 adapter into the pipeline (Figure 6)

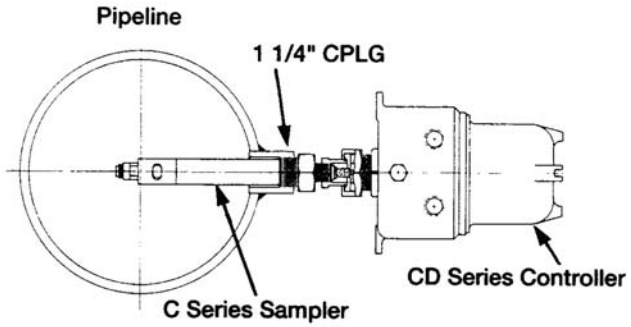


Figure 5—Typical installation of a non-retrievable sample probe (probe cannot be removed while the line is full and pressurized)

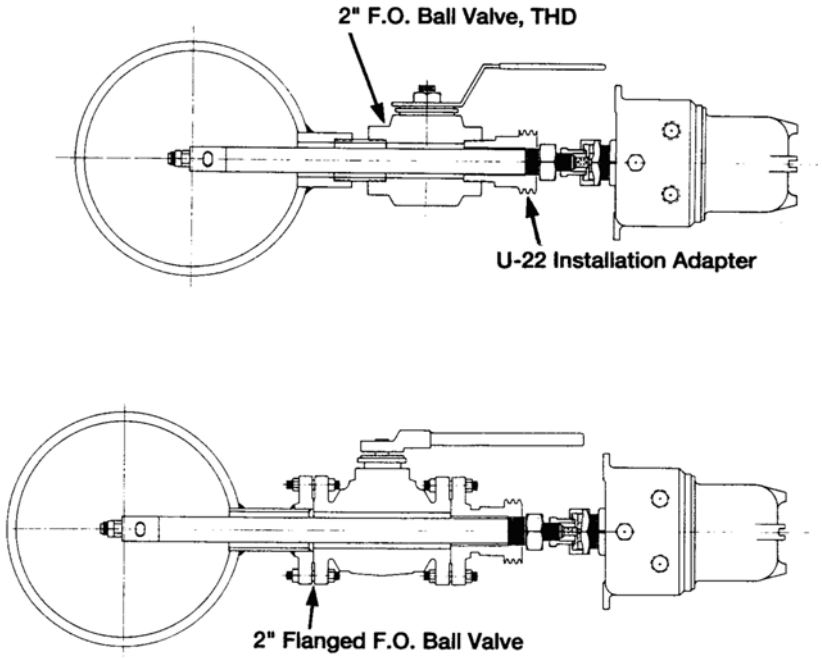


Figure 6—Typical installation of a retrievable sample probe (probe can be removed while full and under line pressure with a Clif Mock True-Cut A-3 sample retriever).

To install a sample probe in a pipeline, perform the following steps:

1. Position the sample probe so that the direction of the arrow stamped on the hexagonal surface of the probe (Figure 7) is parallel to the flow in the pipeline. This allows fluid to pass through the sample window.
2. Install the sampler port in the pipeline in accordance with API Chapter 8, Section 2 requirements.
3. Connect tubing (1/4 in. to 3/8 in.) from the sample probe to the receptacle so that the tubing slopes continuously downward from the probe (Figure 8).
4. Before attaching the sample drive to the probe, start the drive unit. With the shaft of the drive unit facing you, the shaft should rotate CLOCKWISE.

Important—If the shaft does not rotate CLOCKWISE, the motor is wired incorrectly. Consult the factory. Do not attempt repairs.

5. Stop the drive unit.

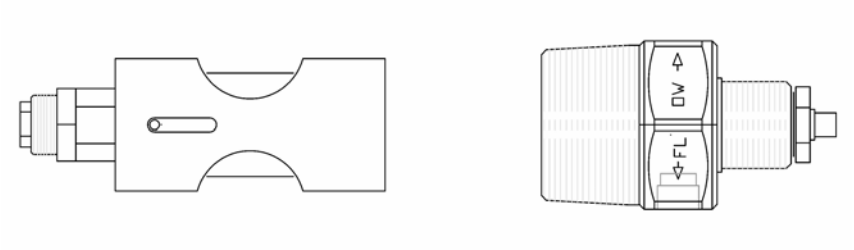


Figure 7—Flow direction indicator

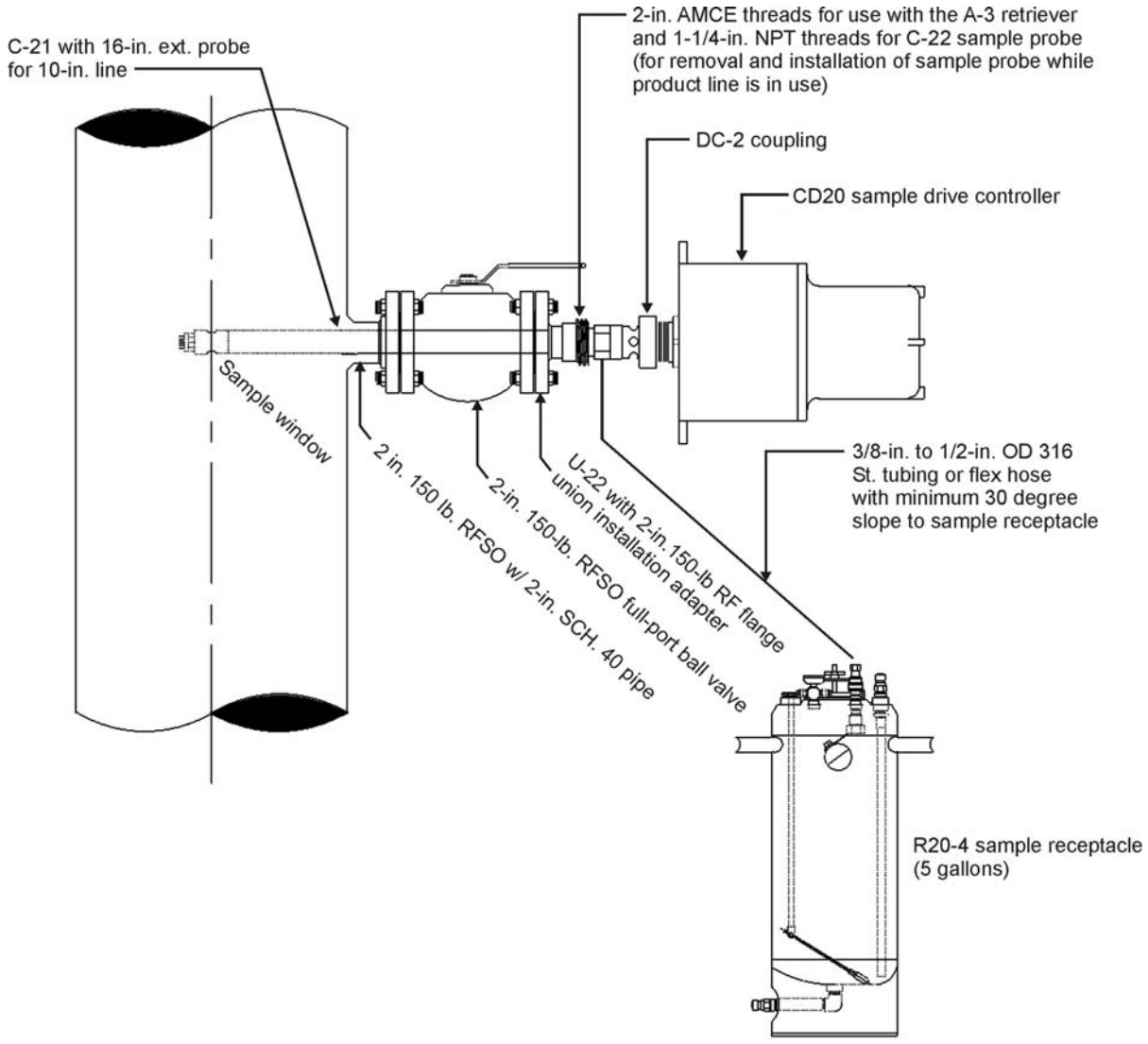

C-21 with 16-in. ext. probe for 10-in. line
2-in. AMCE threads for use with the A-3 retriever and 1-1/4-in. NPT threads for C-22 sample probe (for removal and installation of sample probe while product line is in use)
DC-2 coupling
CD20 sample drive controller
Sample window
2 in. 150 lb. RFSO w/ 2-in. SCH. 40 pipe
2-in. 150-lb. RFSO full-port ball valve
U-22 with 2-in. 150-lb RF flange union installation adapter
3/8-in. to 1/2-in. OD 316 St. tubing or flex hose with minimum 30 degree slope to sample receptacle
R20-4 sample receptacle (5 gallons)

Figure 8—Installation of the C21/C22 sample probe within a sampling system

6. Attach the drive unit to the sample probe (Figure 9) in the following manner:
   a. Unscrew the DC-2 coupling from the CD20 sample drive controller. (The DC-2 coupling is attached to the CD20 sample drive when it is shipped from the factory.)
   b. Thread the DC-2 coupling onto the sample probe and tighten.
   c. Line up the slot on the output shaft of the CD20 Sample Drive with the pin (DC-1 coupling is attached to the sample probe at the factory) on the DC-1 coupling, and thread the drive onto the DC-2 coupling. **HAND TIGHTEN ONLY.**
7. Check the direction of rotation per the attached rotation warning plate (Figure 10). With the drive shaft turned away from you, the drive should rotate the delivery tube COUNTER-CLOCKWISE.

Caution—If the delivery tube turns CLOCKWISE, the probe is installed incorrectly. Do not operate the probe in this position. Doing so will cause the delivery tube to disconnect from the cam. The sample probe must be disassembled before the delivery tube can be reconnected.

8. Complete electrical connections in accordance with the instructions in the CD20 or CD20A sampler drive manual.

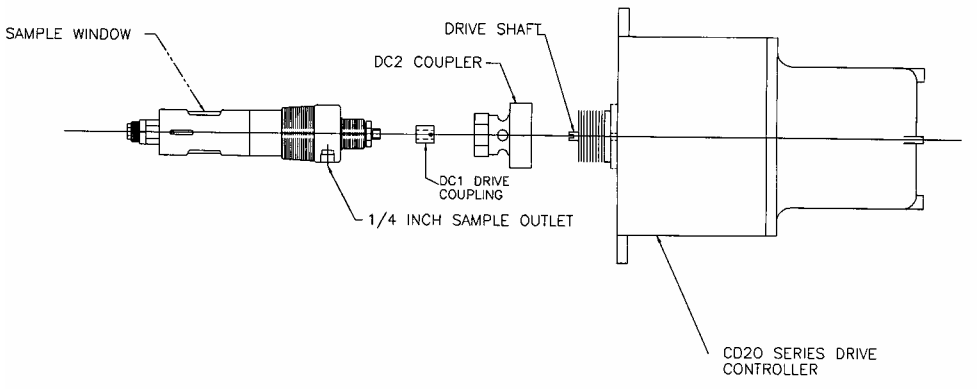


Figure 9—Drive controller to sample probe connection

Figure 10—Rotation warning plate (also shown in Figure 1)

Operating the Sample Probe

1. Start flow through the pipeline.
2. Turn the sample probe drive unit ON. The sampler should begin to collect samples immediately.
3. To verify that the sample probe is operating properly, disconnect the discharge line from the sample probe at the receptacle. If the probe is operating properly and has taken several sample grabs (20 to 100), product should be visible in the receptacle and in the discharge line.

Maintenance

The frequency of repairs will depend on each application. Generally, the True-Cut C21/C22 Isokinetic Sampler should be cleaned and inspected every six (6) months.

Repairs

Important—Read the following instructions carefully and review the Bill of Materials and the assembly drawing at the end of this manual before attempting to disassemble or reassemble the sample probe. The item numbers referenced in this section identify the parts shown in the assembly drawing.

The following tools are required for removing and repairing a sample probe

- 15-in. crescent wrench or a 1 3/4-in. open-end wrench
- Truarc pliers #21/389PROTO
- a long, thin, sharp-pointed tool (scribe)(SCRIBE)
- 4-in. needle nose pliers
- non-marring hammer or mallet
- delivery tube holder (part no. 50142208052)
- 3/32-in. hexagonal socket
- vise with soft jaws
- 1/8-in. punch
- set of V blocks
- pliers
- fine-cut file
- 320-grit sandpaper and 4/0 polishing paper
- screwdriver

Removal of the Sample Probe

To remove the sample probe, perform the following steps:

Caution—ALWAYS disconnect and lockout the power to the CD20 sample drive controller at the power source before attempting to remove the sample probe from the line.

1. Remove the drive from the head of the sample probe. Inspect components as they are disassembled and look for defects or reasons for failure.
2. Remove the DC-1 coupling assembly (item 1), felt washer (item 2) and rotation warning plate (not shown) attached to the sample probe.
3. Disconnect the sample discharge line to the receptacle.
4. Remove the tubing connector from the 1/4-in. NPT discharge port in the sample probe and inspect it for possible plugging.
5. If the line is pressured, refer to instructions for using a True-Cut sample probe retriever to remove the sample probe from the line.

   If the line is empty and not pressured, proceed to step 6.
6. Remove the sample probe from the line with a 15-in. crescent wrench or open-end wrench. The sample probe opening in the pipeline may be plugged with a 1 1/4-in. NPT pipe plug.

Disassembly and Inspection of the Sample Probe

Important—The following instructions refer to the "cage" and "hex." The cylindrical end of the sample probe is the cage and the hex portion is the body.

To repair the sample probe, perform the following steps:

1. Prepare a clean padded tabletop or workspace (for example, shop rags on a workbench).
2. Place a pan of clean solvent nearby. If necessary, soak the sample probe in the solvent for 30 minutes before attempting to disassemble.
3. Clamp the sample probe body (item 6) vertically in a vise on the 1 ¾-in. hex body with the cage DOWN.
4. Inspect the end of the delivery tube for any burrs or rough surfaces that could damage O-rings when they are removed from the tube. Deburr or file any rough surfaces before proceeding with the disassembly.
5. Remove the stabilizer assembly (item 3). This includes a stabilizer body, stabilizer body O-ring (item 26), O-ring (item 4), and a Teflon® slipper seal (item 5).
6. Remove the O-ring (item 26) and the O-ring/slipper seal assembly (items 4 and 5) if they do not come out with the stabilizer body.
7. Reposition the sample probe body assembly (item 6) vertically in a vise with the CAGE END UP. Position the discharge port in hex body so that it faces away from you.
8. Remove the retaining ring (item 16) at the cage end by depressing the spring cup assembly (items 12, 13, 14 and 15) with your thumb, and releasing the retainer ring with Truarc pliers.

9. Slowly release compression on the spring cup assembly and remove the spring cup assembly (items 12, 13, 14 and 15).
10. Lift the frog (item 18) out using needle nose pliers or some other sharp instrument.
11. Remove the torque pin (item 17) by pushing it out through the slots on the cage.
12. Remove the piston assembly (item 19) and seat (item 22) with the cam and liner assembly (item 9) and delivery tube (item 25) as follows:
    a. Place a container or cloth beneath the assembly to catch any fluid that spills out during disassembly.
    b. Grasp the cam with the thumb and fingers through the window in the cage.
    c. Gradually lift the cam and liner assembly out, rotating it to the left. Fluid trapped between the stem and the body will spill out the bottom.
    d. Remove the cup and piston assembly while holding it over the padded table top. If the seat (item 22) is stuck to the bottom of the cup and is removed with the assembly, the padded surface will catch the seat if it falls, protecting the hardened surface face from being damaged.
    e. If the seat is not removed with the cup, hold the cam and delivery tube in a vertical position and tap the end of the cam lightly on the padded tabletop to release the seat, also check to see if the seat O-ring remained on the sample body item 6 if so remove the O-ring.
    f. Remove the seat O-ring (item 23) and inspect it for wear.
    g. If the Teflon® thrust washer (item 8), stainless steel thrust bearing (item 7), sleeve (item 24), and O-ring and slipper seal assembly (items 4 & 5) do not come out with the tube assembly, tap the cage end of the sample probe lightly on the padded table top to release them. Take care not to damage the snap ring groove in the cage.
    h. If the Teflon® thrust washer (item 8), stainless steel thrust bearing (item 7), sleeve (item 24), and O-ring and slipper seal assembly (items 4 & 5) do not come out with the tube assembly, tap the cage end of the sample probe lightly on the padded table top. If they are not released, insert a long, thin, flat-end screwdriver into the opening of the cage and gently pry out the remaining items. Take special care not to damage the inner surface of the sleeve (item 24).
13. Inspect and evaluate the sample cup (item 11), piston assembly (item 19), and seat (item 22) as follows:
    a. Before disassembling the sample cup and piston assembly, check the thrust pin (item 10) for wear, especially in the area where it works against the cup in the vertical slots. Also inspect the ends where the pin rides on top of the cam. Look for wear to the slots in the cup and to the top surface of the cam. If the thrust pin has grooves or marks in these areas, replace it.

b. To remove the piston assembly from the cup, push the thrust pin out through one side of the cup (the pin is held in by a spring-loaded stainless steel ball), and shake the piston free of the cup. If the slots in the cup are badly worn, and/or a buildup of metal is visible inside the cup, the piston may have to be pried from the cup through the window in the cup, carefully pry on one side of the piston and then on the other. Because the piston and the cup are stainless steel, they are easily damaged. If both the piston and sample cup are damaged in the attempt to remove the piston, replace both items.

c. After removing the piston, inspect the condition of the seal tip (item 20). If it is an elastomer tip, the elastomer should be resilient, spherical in shape, and free of grooves or cuts. A Teflon® tip should be cone-shaped. If the tips do not conform to the above description, replace them. Note: Only the Teflon® seal tip has a backup (item 21).

d. Inspect the cup and seat for wear and flatness as follows. First, wash both the cup and the seat with solvent and wipe them dry with a lint-free tissue or cloth. Inspect the hardened sealing surfaces for scratches or nicks. Holding the cup and the seat over the padded tabletop (to prevent the seat from being damaged should it come loose and fall), carefully slide the plated surfaces of the two parts together and lightly rotate. The surfaces should feel very smooth; if they do not, clean, inspect, and try again, increasing pressure while rotating.

e. The proper flatness of the two surfaces should allow the two parts to stick together, and this "sticking" action should support the weight of the seat. The sealing surfaces, which are hardened, may appear shiny in areas where the two parts have been in contact. Replace all damaged parts.

14. Inspect the cam and liner assembly (item 9) and delivery tube (item 25) as follows:

a. Clean and inspect the Teflon® lining inside the cam housing for excessive wear, pitting, or erosion.

b. Observe the condition of the seat locator pin in the bottom of the cam.

c. Clean and inspect the tube in the areas within approximately 1 in. of the cam and approximately 1 in. from the cross-holes toward the other end of the delivery tube. The pressure seals, (slipper seal, item 5, and O-ring, item 4) work within these areas. Therefore, the tube must be kept in good condition.

d. If the delivery tube requires replacement, note that the threads on the cam are LEFT HAND pipe threads, NOT the conventional right-hand threads.

15. To remove the tube, perform the following steps:

a. Clamp the tube in a vise using the tube holder.

b. Line up the cross-holes on the delivery stem with the top hole of the tube holder and insert a 1/8-in. or 1/4-in. punch thorough these holes; then, clamp down on the tube holder. (Do not over tighten to avoid crushing the delivery tube.)

c. Insert a rod, screwdriver, or one handle of a pair of Truarc pliers through the window in the cam and turn CLOCKWISE as viewed from the cam end.

16. To clean out a plugged tube, remove the screw (item 28) and O-ring (item 27) to allow an opening for removing foreign material.
17. Clean and inspect the inside of the body and cage for excessive wear, especially in the area where the torque pin is located.
18. Inspect all O-rings for damage. O-rings should be pliable and free of nicks, cuts, and flat surfaces.
19. Inspect all slipper seals and Teflon® Bal seals for damage or deformity.

Reassembling the Sample Probe

Important—Always clean all O-rings and components and lubricate with a generous coating of a Teflon®-based lubricant or equivalent before reassembling the sample probe.

Reassemble the sample probe as follows:

1. Lay the parts out in sequence and replace all damaged parts.
2. Assemble the cam and liner assembly (item 9) and delivery tube (item 25) as follows:
   a. Clamp the delivery tube in a vise using the tube holder.
   b. Line up the cross-holes on the delivery stem with the top hole of the tube holder and insert a 1/8-in. or 1/4-in. punch thorough these holes; then, clamp down on the tube holder. (Do not over tighten to avoid crushing the delivery tube.)
   c. Apply a Teflon® thread-sealing compound on the threaded end of the delivery tube.
   d. Thread the cam on the tube by turning the cam COUNTERCLOCKWISE as viewed from the thread end of the tube.
   e. Tighten securely by hand.
      - If either the cam or the tube is a new part, further tighten 1/2 to 3/4 turn. Place a rod, a screwdriver, or one handle of a pair of Truarc pliers through the window in the cam for leverage.
      - If the parts are not new, a 1/4 to 1/2 turn is sufficient.
   f. Verify that the flat on the end of the tube and windows in the cam are parallel to each other.
   g. Wipe excess thread compound from the tube.
   h. Remove the tube and cam from the vise and lay them in the V blocks.
   i. Roll the tube back and forth (rotating it 360° in each direction) and observe the end of the cam to make sure the cam and tube are concentric.
   j. If the cam and tube are not concentric, place the tube back in the vise using the holder with the cam positioned close to the holder. Lightly tap the cam with a soft-headed hammer to force it into alignment. Several attempts may be required.

k. Place the Teflon® thrust washer (item 8) and thrust bearing (item 7) on the tube.

3. Use the cam and tube assembly to assemble the stabilizer (items 3, 4, and 5).

   a. Place the O-ring (item 4) over the slipper seal (item 5); making certain the slipper seal conforms to the O-ring. If all seals are Teflon®, a Bal seal is used in place of items 4 and 5.

   b. Slip the O-ring/slipper seal combination or the Bal seal onto the tube and continue sliding the seal down the tube against the thrust bearing (item 7), taking care not to roll or deform the surface of the O-ring /slipper seal assembly (items 4 & 5).

   c. Push the stabilizer body (item 3) until the body is against the thrust bearing. The parts should snap into place.

   d. Remove the stabilizer from the delivery tube, making sure all components stay in the stabilizer body.

   e. Put the O-ring (item 23) on the end of the stabilizer body (item 3) and set it aside.

4. To put the sleeve assembly (items 4, 5, & 24) together, use the cam and tube assembly.

   a. Slip the O-ring (item 4) and slipper seal (item 5) onto the tube assembly. If all seals are Teflon®, a Bal seal is used in place of items 4 & 5.

   b. Slide the sleeve (item 24) over these parts, and squeeze or snap into place. Slip O-ring (item 23) over the sleeve. Leave this assembly on the tube.

5. Place the seat (item 22) into the cam and liner assembly (item 9) and delivery stem (item 25) as follows:

   a. Slip the lubricated O-ring (item 23) over the seat. (The seat and sample cup are described in detail in *Disassembly and Inspection*, page 8)

   b. Hold the cam assembly at a 45° angle with the seat locator pin on top.

   c. Position the seat on a wood-tipped scribe, using the hole near the notch in the seat. (Handle the seat with special care to prevent damage to the coating on the seat.)

   d. Slip the seat into the cam body, aligning it with the locator pin.

   e. When the seat is in position, turn the cam upright (tube down) and recheck the seat for alignment.

   f. When it is properly aligned, use your (clean) finger or a soft instrument to apply pressure on the seat and force the O-ring into its groove.

   g. Clean the seat with lint-free tissue and use a drop of light oil to lubricate the seat.

   h. Using the tube holder, place the tube back in the vise in a vertical position with the cam UP.

6. Check the piston and the sample cup for proper fit (the piston should move freely in the cup when the cup is tilted up and down). If it does not, polish the piston with 320-grit sandpaper and 4/0 polishing paper or deburr for a free fit.
7. Replace the elastomer piston seal tip (item 20) or Teflon® piston seal tip and backup (items 20 and 21), if necessary. See *Elastomer Seal Tip Replacement*, page 14, and *Teflon® Seal Tip Replacement*, page 15, for detailed instructions.
8. Put the piston back into the cup so that the seal is aligned with the hole in the bottom of the sample cup. The thrust pin opening in the piston should be in line with the vertical slots in the sample cup.
9. Insert the thrust pin in the piston, depress the spring-loaded ball with a punch, and simultaneously exert force on the pin until it can pass the ball. Continue to move the pin until it snaps into place. (The Teflon® backup may also have to be depressed to allow the thrust pin to slip into place.)
10. Lubricate the sample cup and carefully slip it into the cam housing with a twisting motion until it touches the seat.
11. Continue twisting and applying a light pressure; the action should be very smooth, as when you inspected the sample cup and seat earlier. If it is not, remove the sample cup from the cam housing and clean again. To continue, align the window in the sampler cup with the window on the cam. The two windows should line up top and bottom within an approximate 0.010 in. difference. If the cup window is too high, the seat O-ring may not be properly seated. Press on the top of the cup to seat the O-ring.
12. Remove the tube assembly with the cup and piston assembly from the vise.
13. Position the probe body assembly (item 6) vertically in the vise with the cage end UP.
14. Put the cam and liner assembly and delivery tube assembly into the probe body from the cage end with a twisting motion. Continue this motion until the tube assembly is seated in place.
15. Align the hole in the rim of the sample cup with the slots in the sides of the cage, and insert the torque pin (item 17).
16. Place the frog (item 18) on top of the sample cup so the slot in the frog fits on the torque pin. The torque pin must be centered for the frog to fit properly.
17. Stack the spring (item 15), spring cup (item 14), spring cup retainer (item 12), and retainer lock nut (item 13), place the retaining ring (item 16) with its flat and not rounded surface on top of the frog.
18. Using the same method that was used to remove these parts, apply force to the thrust plate to compress the spring, allowing the retaining ring to snap into a groove in the end of the probe cage.
19. Check the action of the assembly using either of the two following procedures:
    - Grasp the cam through the window in the cage. Using fingers and a thumb, rotate the cam CLOCKWISE as viewed from the cage end. The piston should rise and fall freely with rotation.

- Apply a light force on the end of the delivery stem; it should depress slightly (at least 1/32 in.).

20. Invert the probe body in the vise and install the stabilizer. Using a twisting motion, slip the stabilizer onto the delivery tube and thread it into the body.
21. Tighten the connection with a wrench to a snug fit against a metal shoulder at the bottom of the stabilizer.
22. If the O-ring (item 27) and screw (item 28) were removed, lubricate them and replace.
23. Replace the felt washer (item 2) and coupling assembly (item 1) on the delivery tube. Slip the coupling onto the delivery tube as far as it will go.
24. Replace the warning disc on the body.
25. Rotate the coupling assembly by hand (or with a small crescent wrench) in a COUNTERCLOCKWISE direction, as viewed from the coupling end to test the completed assembly.

Caution: Never rotate the coupling assembly in a CLOCKWISE direction. CLOCKWISE rotation will loosen the delivery tube from the cam.

26. Perform a test under pressure, if possible, before putting the sample probe back into service. During testing, check the sample probe's function by manually rotating the shaft COUNTERCLOCKWISE. Sample size should be 1 1/2 cc/rev for the C21 sample probe, and 3 cc/rev for the C22 sample probe.

Elastomer Seal Tip Replacement

To replace the elastomer piston seal tip (item 20) with a new elastomer seal tip, perform the following steps:

1. Cut off the tip of the old seal flush with the piston surface and push it out the top of the piston with a small-diameter punch.
2. Lubricate the new seal and hole in the piston with lightweight oil.
3. Insert the small-diameter lead of the elastomer seal into the top of the piston. Push until the lead is through the bottom.

Important—The Half Bal-shaped elastomer seal is larger than the hole in the bottom of the piston, and will meet with resistance as the lead is pulled through the piston. Take special care not to pull the lead off during this process.

4. Gradually pull the lead until you feel the large portion of the seal reach the restriction near the bottom of the piston.
5. Working the lead in a small circle while pulling, SLOWLY work the seal through the bottom of the piston. If the seal sticks or resists movement, apply force to the TOP of it using a small-diameter punch. DO NOT PULL ON THE LEAD WITH EXCESSIVE FORCE.

6. When the seal "pops" through the bottom of the piston, STOP. Make sure the seal is completely through and flush against the piston.
7. Cut the lead off approximately 1/32 in. from the bottom of the Half Bal Seal; no backup is required.

Teflon® Seal Tip Replacement

In applications where operating at pressures exceed 195 psi, the elastomer seal tip may wear out quickly. Operators may replace the elastomer seal tip with a Teflon seal tip for longer wear. The replacement parts are Teflon seal piston assembly (item 19, P/N 50142208085), Teflon seal tip (item 20) and backup (item 21).

Important—The replacement procedure for replacing an elastomer seal tip is different from the procedure used to replace an existing Teflon seal tip. Both procedures are provided in step-by-step instructions below.

To replace an elastomer seal tip with a Teflon® seal tip and backup, perform the following steps:

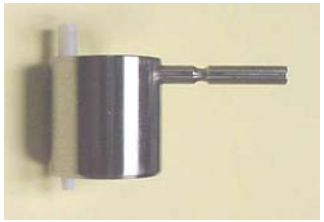
1. Remove the piston assembly (item 19, P/N 50142200065) from the sample cup.
2. Push the old seal tip out through the top of the piston.

3. Replace the existing piston (5014220065) with the new piston assembly P/N 50142208085.

4. Place the Teflon seal tip into the new piston (cone-tip portion first) and insert the backup behind the seal tip.

5. Shear / cut the Teflon seal tip backing as follows:

   a. Insert the thrust pin in the side of the piston opposite where the Teflon seal tip backing is inserted, depress the spring-loaded ball with a punch, and simultaneously exert force on the pin until it passes the ball.



   b. Continue to move the pin until it stops on the Teflon seal tip backing.

   c. While holding the end of the Teflon seal tip backing and the piston between your thumb and index finger, place the piston assembly between partially opened jaws of a vise.

   d. While exerting force on the Teflon seal tip backing and the piston, use a small hammer to strike the end of the thrust pin until it shears / cuts the Teflon seal tip backing.

   e. Remove the thrust pin from the piston, being careful not to disturb the Teflon seal tip and Teflon seal tip backing assembly.

6. Before replacing the piston assembly in the sample cup, place a 1/8-in. to 1/4-in. pin through the window openings of the sample cup. This will prevent you from disturbing the Teflon seal tip and Teflon seal tip backing assembly.

7. Place the piston assembly (item 19) in the sample cup (item 11) so that the seal tip is aligned with the hole in the sample cup. Insert the thrust pin (item 10), depress the spring-loaded ball with a punch, and simultaneously exert force on the pin until it passes the ball.

8. Seat the Teflon seal tip in the sample cup hole as follows:

   a. Hold the sample cup and piston assembly (sample cup up) in the palm of your hand.

   b. Use a 3/4-in. O.D. × 5-in. long wooden dowel pin to apply force to the piston assembly in the sample cup such that an indentation is created on the Teflon seal tip.

c. Forcibly strike the opposite end of the dowel pin against a hard surface.

d. Repeat step c, if necessary, to create the indentation on the Teflon seal tip. (Be careful not to scratch the coating on the bottom of the sample cup.)

9. Remove the thrust pin and the piston assembly from the sample cup, being careful not to disturb the Teflon seal tip and Teflon seal tip backing assembly. Observe the indentation of the Teflon seal tip made by step 6c.

10. To remove the excess of the Teflon seal tip, temporarily replace the thrust pin on the piston. Use a razor or a very sharp knife to cut the excess of the Teflon seal tip between the indentation and the end of the Teflon seal tip.

11. Remove the thrust pin from the piston assembly. Be careful not to disturb the Teflon seal tip and Teflon seal tip backing assembly.

12. Before replacing the piston assembly back into the sample cup, place a 1/8-in. to 1/4-in. pin through the window openings of the sample cup. This will prevent you from disturbing the Teflon seal tip and Teflon seal tip backing assembly.

13. Put the piston (item 19) into the sample cup (item 11) so that the seal tip is aligned with the hole in the sample cup. Insert the thrust pin (item 10), depress the spring-loaded ball with a punch, simultaneously exert force on the pin until it passes the ball. Remove the 1/8-in. or 1/4-in. dowel pin.

To replace an existing Teflon® seal tip and backup with a new Teflon® seal tip and backup, perform the following steps:

1. Remove the piston assembly (item 19, P/N 50142200065) from the sample cup.
2. Push the old seal tip and backup out through the top of the piston.
3. Place the Teflon seal tip into the piston (cone-tip portion first, and then backup).
4. Shear the Teflon seal tip backing as follows:
    a. Insert the thrust pin in the opposite side of the piston where the Teflon seal tip backing is inserted, depress the spring-loaded ball with a punch, and simultaneously exert force on the pin until it passes the ball.
    b. Continue to move the pin until it stops on the Teflon seal tip backing.
    c. While holding the end of the Teflon seal tip backing and the piston between your thumb and index finger, place the piston assembly between partially opened jaws of a vise.
    d. While exerting force on the Teflon seal tip backing and the piston, use a small hammer to strike the end of the thrust pin until it shears the Teflon seal tip backing.
    e. Remove the thrust pin from the piston, being careful not to disturb the Teflon seal tip and Teflon seal tip backing assembly.
5. Before placing the piston assembly into the sample cup, place a 1/8-in. to 1/4-in. pin through the window openings of the sample cup, this will you from disturbing the Teflon seal tip and Teflon seal tip backing assembly.
6. Place the piston (item 19) into the sample cup (item 11) so that the seal tip is aligned with the hole in the sample cup. Insert the thrust pin (item 10), depress the spring-loaded ball with a punch, and simultaneously exert force on the pin until it passes the ball.
7. Seat the Teflon seal tip in the sample cup hole as follows:
    a. Hold the sample cup and piston assembly (sample cup up) in the palm of your hand.

b. Use a 3/4-in. O.D. × 5-in. long wooden dowel pin to apply force to the piston assembly in the sample cup such that an indentation is created on the Teflon seal tip.

c. Forcibly strike the opposite end of the dowel pin against a hard surface.

d. Repeat step c, if necessary, to create the indentation on the Teflon seal tip. (Be careful not to scratch the coating on the bottom of the sample cup.)

8. Remove the thrust pin and then the piston assembly from the sample cup, being careful not to disturb the Teflon seal tip and Teflon seal tip backing assembly. Observe the indentation of the Teflon seal tip made by step 6c.

9. Remove the excess of the Teflon seal tip as follows:

   a. Place the thrust pin back on the piston.

   b. Use a razor or a very sharp knife to cut the excess of the Teflon seal tip between the indentation and the end of the Teflon seal tip.

   c. Remove the thrust pin from the piston assembly. Do not disturb the Teflon seal tip and Teflon seal tip backing assembly.

10. Before replacing the piston assembly back into the sample cup, place a 1/8-in. to 1/4-in. pin through the window openings of the sample cup to prevent disturbing the Teflon seal tip and Teflon seal tip backing assembly.

11. Place the piston (item 19) in the sample cup (item 11) so that the seal tip is aligned with the hole in the sample cup. Insert the thrust pin (item 10), depress the spring-loaded ball with a punch, and simultaneously exert force on the pin until it passes the ball. Remove the 1/8-in. or 1/4-in. dowel pin.

Note: When ordering spare parts, be sure to specify the serial number and model number of the sample probe.

Retrofitting C21/C22 Standard Samplers with Spring Cup Assembly

C series sample probes manufactured since 1989 are designed with a spring cup assembly, which prevents the dislocation of the valve seat during back-flushing or when used in vacuum service.

C-series samplers manufactured before 1989 can be retrofitted to replace the standard thrust cup with the spring cup assembly.

Note—The year of manufacture can be identified by the serial number stamped on the hex head of the C-sample probe. The first two digits signify the year (Ex.: 90A1010 was manufactured in 1990).

To retrofit an older model C-series sample probe with the new spring cup assembly, perform the following steps:

1. Clamp the sampler in a vise with the snap ring side facing up.

2. Remove the retaining ring (item 16) and set it aside.

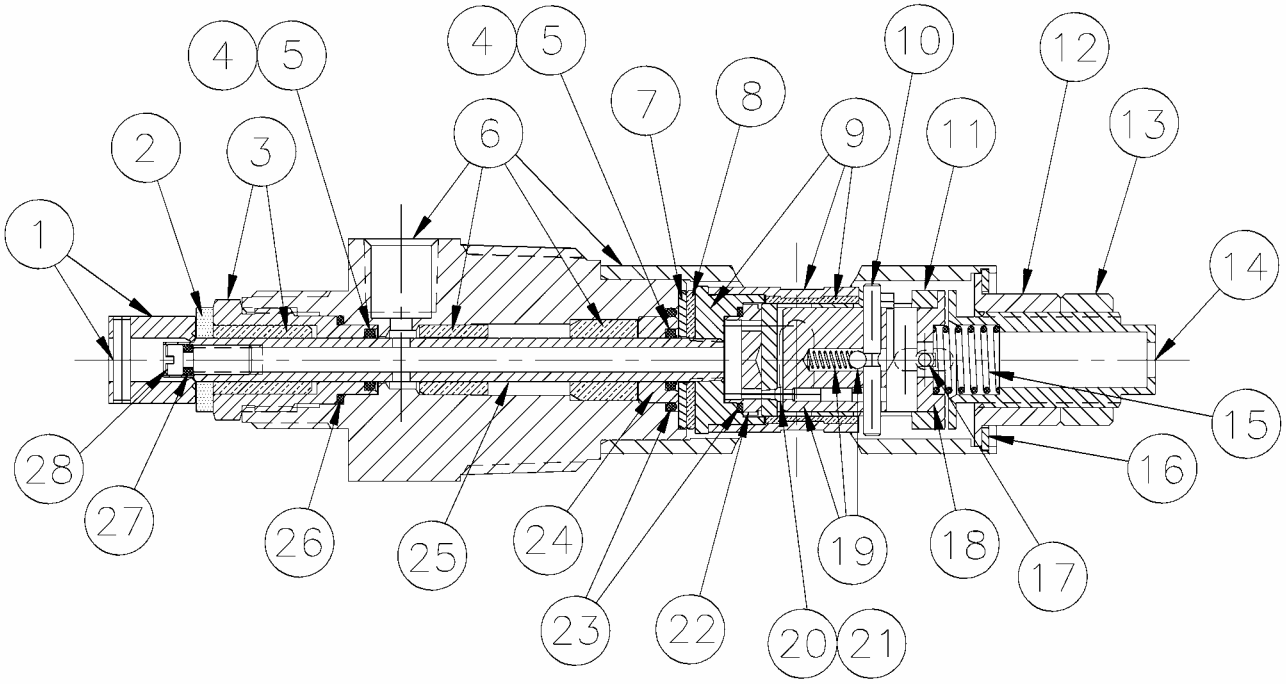
3. Remove the thrust cup (part no. 5014200069) and discard it.

4. Thread the spring cup retainer (item 12) fully onto the spring cup (item 14).

5. Reinstall the retaining ring.

6. Using a 13/16-in. open-end wrench, grasp the spring cup retainer. Using a 1/2-in. open-end wrench, screw in the spring cup until it bottoms out, and then back it out 1/8 of a turn.

7. Install the locknut (item 13) tight against the spring cup retainer, taking care not to disrupt the adjustment of the spring cup.



Bill of Materials

Item	Qty.	Part No.	Description
1	1	50142150931	Assembly, DC-1 Coupling
2	1	50142200012	Felt Washer
3	1	50142200016	Assembly, Stabilizer
4*	**2**	**50025402180**	**O-Ring (Viton®)**
	2	**50025402183**	**O-Ring (Buna-N)**
	2	**50142200013**	**Teflon® Bal Seal**
5*	**2**	**50142200009**	**Slipper Seal**
6	1	50142200058	Body Assembly (Standard)
7	1	50142200060	Thrust Bearing (Stainless Steel)
8	1	50142200061	Thrust Washer (Teflon®)
9	1	50142207922	Threaded Hub Cam and Liner Assembly
10	1	50142200066	Thrust Pin
11	1	50142208021	Sample Cup
12	1	50142200075	Spring Cup Retainer
13	1	50142200076	Locknut
14	1	50142200074	Spring Cup
15	1	50142200029	Thrust Spring
16	1	50142200047	Retaining Ring
17	1	50142200068	Torque Pin
18	1	50142200067	Frog
19	1	50142200065	Assembly, Piston, Elastomer Seal
	1	50142208085	Assembly, Piston, Teflon® Seal
20*	**1**	**50142200026**	**Seal Tip, Piston (Viton®)**
	1	**50142200033**	**Seal Tip, Piston (Buna-N)**

Bill of Materials

	1	**50142200084**	**Seal Tip, Piston (Teflon®)**
21*	**1**		**Back-up, Piston (Use w/ Teflon® Seal Tip Only)**
22	1	50142208019	Valve Seat (C21) - 1 Port
	1	50142200020	Valve Seat (C22) - 2 Port
23*	**2**	**50142200005**	**O-Ring, (Viton®)**
	2	**50142200018**	**O-Ring, (Buna-N)**
	2	**50142200008**	**O-Ring, (Teflon®)**
24	1	50142200015	Sleeve
25	1	50142207952	Stem, Delivery Tube (Standard)
26*	**1**	**50025400330**	**O-Ring (Viton®)**
	1	**50025400333**	**O-Ring (Buna-N)**
	1	**50142200006**	**O-Ring (Teflon®)**
27*	**1**	**50142200001**	**O-Ring (Viton®)**
	1	**50142200002**	**O-Ring (Buna-N)**
28	1	50142381413	Screw

***Items included in a seal kit.**

Seal Kits

Item	Qty.	Part No.	Description
		50142150716	C-2 Seal Kit (Buna-N)
		50142150712	C-2 Seal Kit (Viton®)
		50142150709	C-2 Seal Kit (Teflon®)

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